IRISH CATTLE BREEDING FEDERATION

"Application of Genomic Selection in Dairy and Beef Cattle in Ireland"

Dr Andrew Cromie, Technical Director ICBF.

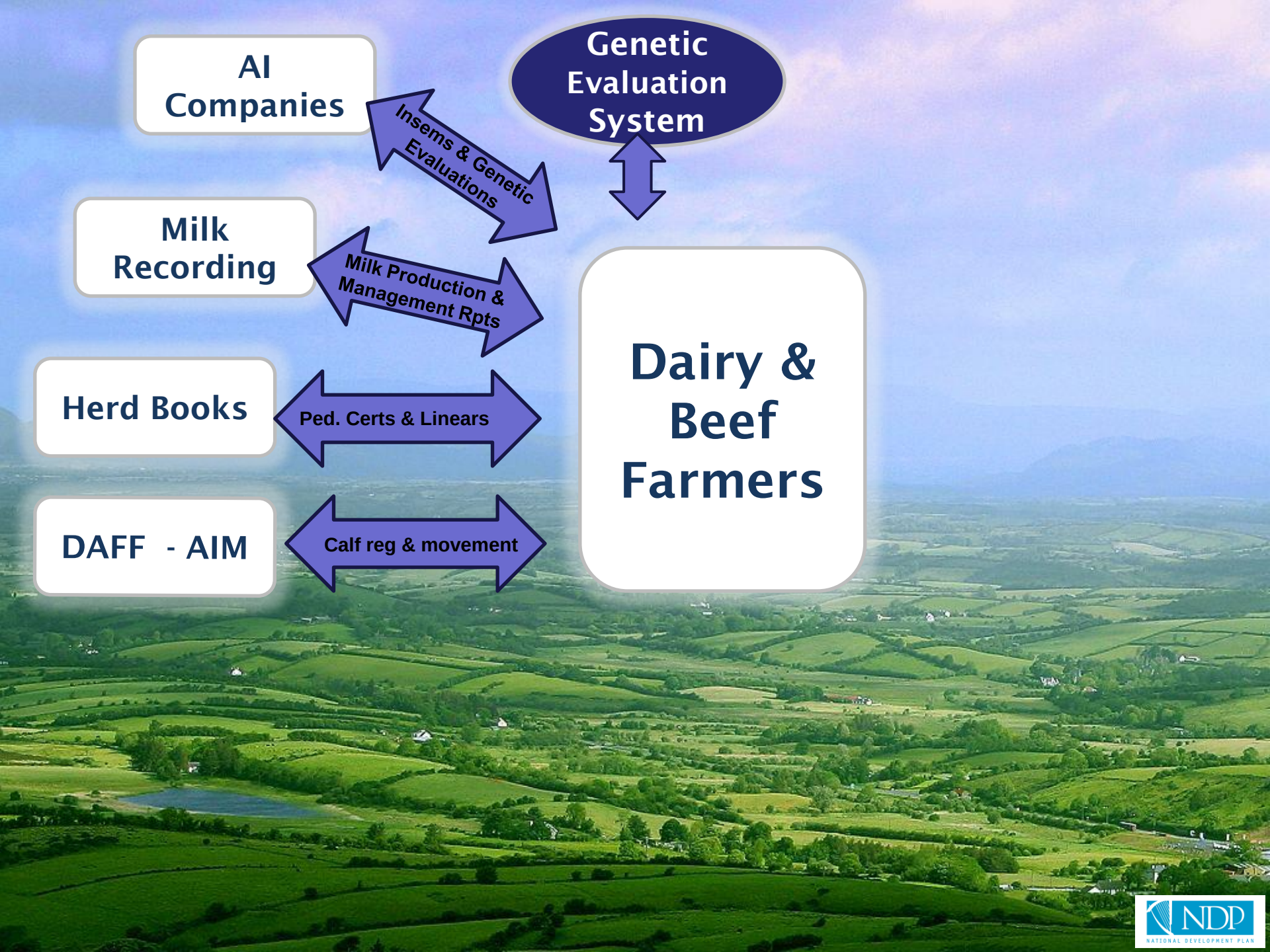
Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

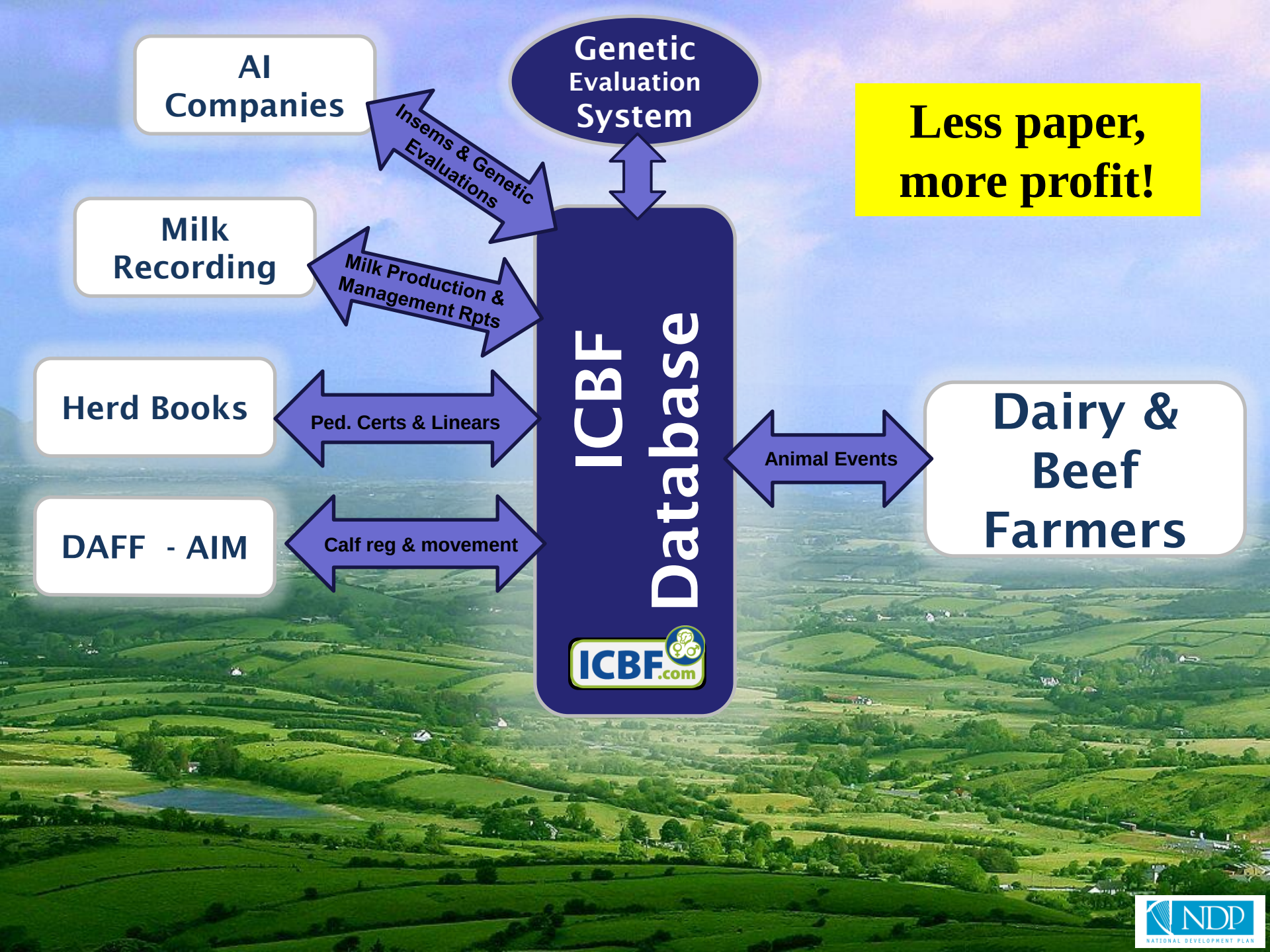
Understanding Ireland!

- Ag-food is important.
  - 7% GDP, 10% employment.
  - Export focused (80%)
    - Population of 4.5m but producing enough food to feed 35m.
- Cohesive industry.
  - DAFM, ICBF, Teagasc….
  - Harvest 2025; Sustainable Growth.

Irish Cattle Breeding.

- Co-ordinated by Irish Cattle Breeding Federation (ICBF).
  - A co-operative of 30 cattle breeding organisations (AI, Herdbooks & Milk Recording organisations) & 2 Farm Organisations.
- Established the ICBF central database in 2002.
  - Now the cornerstone of the Irish cattle industry.
- Focused on "profit from science".
- High level of farmer trust - independent genetic evaluations are key.
- World-leading (research => implementation).
  - 2nd in world to launch dairy genomics, after US.
  - Beef Genomics => largest livestock genomics project globally.


AI Companies
Genetic Evaluation System
Insems & Genetic Evaluations
Milk Recording
Milk Production & Management Rpts
Herd Books
Ped. Certs & Linears
DAFF - AIM
Calf reg & movement
Dairy & Beef Farmers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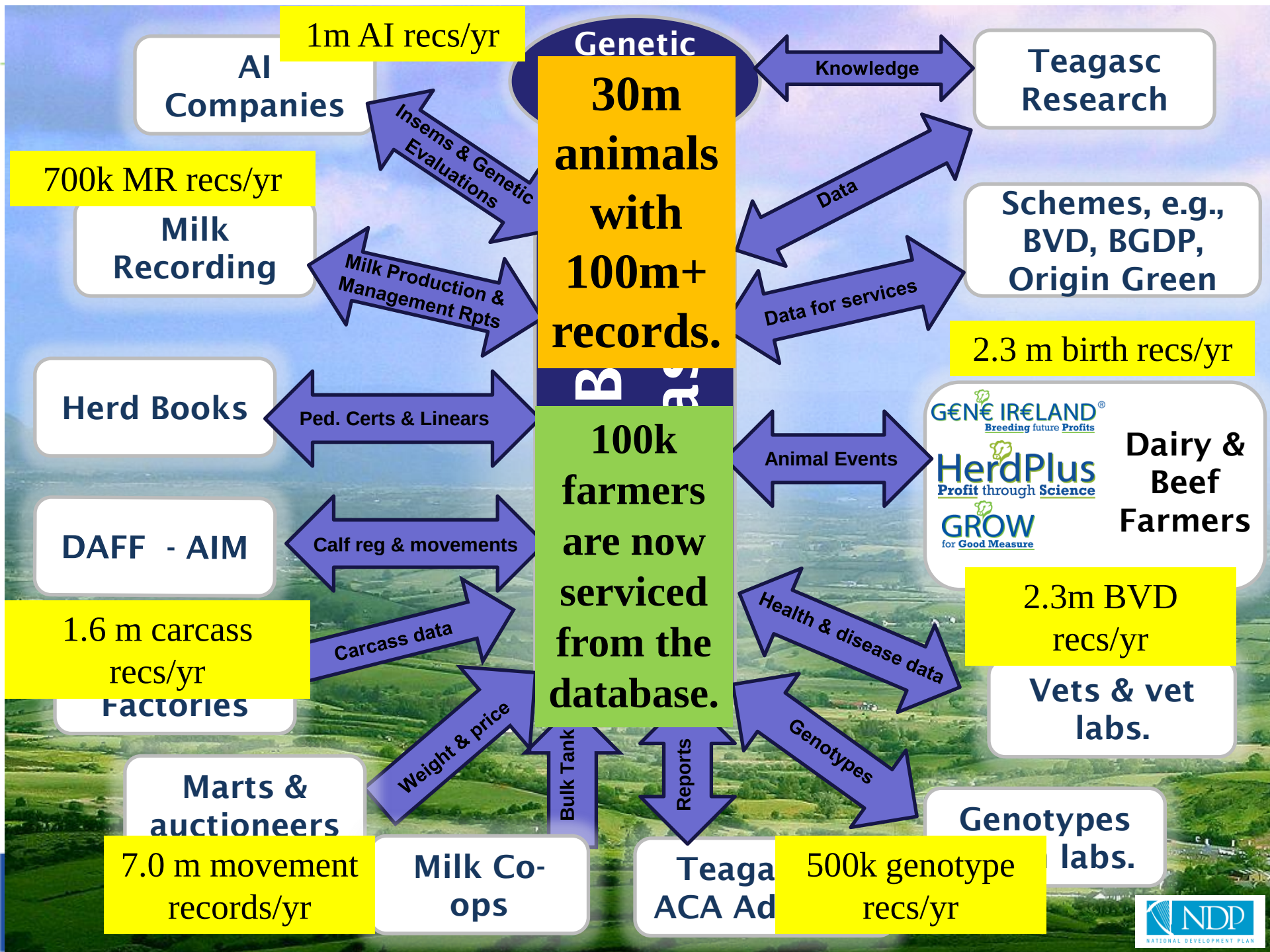
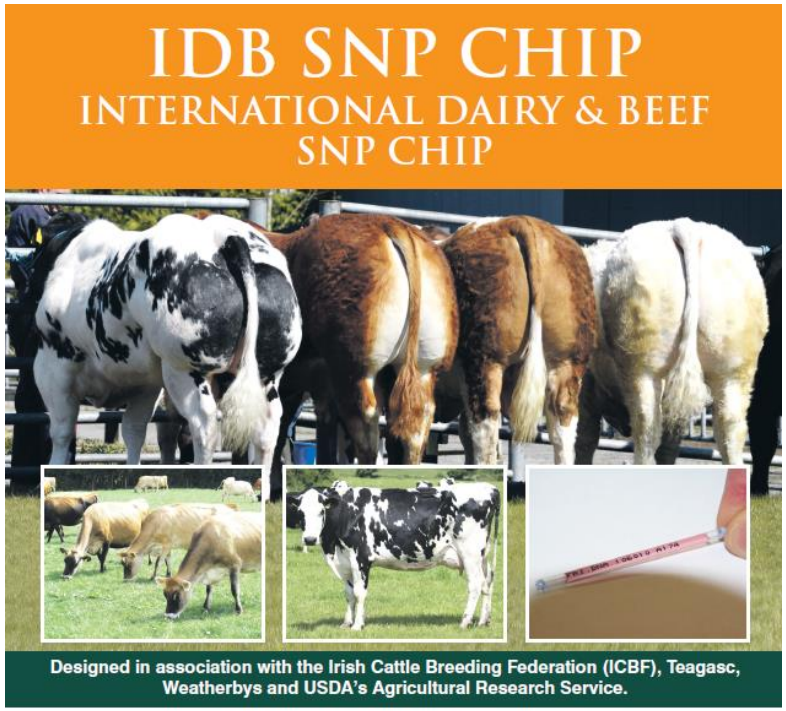
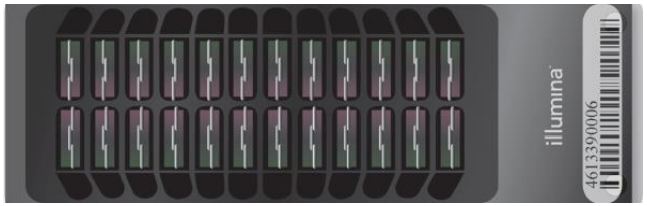
ICBF Database
ICBF.com
Animal Events
Dairy & Beef Farmers
Less paper, more profit!
NDP
NATIONAL DEVELOPMENT PLAN


1m AI recs/yr
AI Companies
Genetic
Knowledge
Teagasc Research
Insems & Genetic Evaluations
30m animals with 100m+ records.
700k MR recs/yr
Milk Recording
Milk Production & Management Rpts
Data
Schemes, e.g., BVD, BGDP, Origin Green
Data for services
2.3 m birth recs/yr
Herd Books
Ped. Certs & Linears
100k farmers are now serviced from the database.
Animal Events
GENE IRELAND Breeding future Profits
HerdPlus Profit through Science
GROW for Good Measure
Dairy & Beef Farmers
DAFF - AIM
Calf reg & movements
2.3m BVD recs/yr
1.6 m carcass recs/yr
Carcass data
Health & disease data
Factories
Vets & vet labs.
Weight & price
Bulk Tank
Reports
Genotypes
Marts & auctioneers
Genotypes labs.
7.0 m movement records/yr
Milk Co-ops
Teaga
ACA Ad
500k genotype recs/yr
NDP
NATIONAL DEVELOPMENT PLAN

IDB Chip – The database in 54k SNP's!





- The International Dairy & Beef Chip.
- Developed in Ireland, with Illumina. Currently on v3.
- 54k SNP's.
  - 40k core, 6k for better imputation, 7k for "regions of interest" & 1k for major genes/defects.
- 160 Major genes/defect.
  - Database will drive this.

Typical Irish dairy farm; 100 cows, calving from mid-Feb (in line with grass growth in Spring) and ending lactation by mid-December.

Where we started; Irish dairy herd 2000

High index Holstein route not the answer

Peter Young

Pregnancy to first service for both groups was just 35 per cent.

This year's fertility results

Very disappointing results from three year trial

EIGHT of the twenty-three empty cows were scanned in calf at 30 days. Embryo loss struck to see the eight repeat near the end of the breeding season.

That's is the hardest pill to swallow for Jack Kennedy, Flor Flynn and the rest of the team that put in huge effort into getting the cows in calf. "It was hugely disappointing. The cows were well fed since they went out day and night on March 10, and they settled very well," said Jack. There was just one embryo loss last year. The biggest problem for them, and for all farmers, is that there is still little known in terms of answers.

Feeding more meals is not the solution. The three-year trial clearly shows that there is no effect of feeding level on fertility.

The 96 cows were spilt into three herds. Each herd contained half-high genetic merit cows (RBI 00 X) and half-Medium merit (RBI 00 y). The herds were fed either

- 400kg meal (Low concentrates, LC)
- 800kg meal (medium concentrates, MC)
- 1500kg meal (high concentrates HC)

The average infertility rate for the different levels of meal was 23 per cent, 25 per cent and 22 per cent respectively.

infertility.

Table 1
Milk production for medium and high merit cows (1998-2000)

	High merit	Medium merit
1998	1,498	1,213
1999	1,675	1,464
2000	1,770	1,564

swer for helping to select cows with higher fertility.

These cows were bred in Ireland and bought from farmers. The previous high merit cows had been bought in from Holland and France.

"However it shows that nationality has nothing to do with it. The results clearly show that poorer fertility is linked to high index Holstein percentage, in the cows

Jack Ke... where based Dillon. "We answe season allow t spread option,

Table 2

	Current trial (1998-2000)		Previous trial (1995-1997)	
	HGI	MGI	HGI	MGI
Submitted in 1st 3 weeks (%)	88	90		
Calving to service interval (days)	77	77	70	71
Calving to conception interval (days)	93	90	86	88
Pregnancy 1st service (%)	49	57	41	53
Pregnancy 2nd service (%)	42	44	37	58
Services/cow	1.83	1.68	1.75	1.7
Infertile rate (%)	17	12	23	6
Percentage Holstein (%)	88	60	92	52

Measures of fertility needed in index

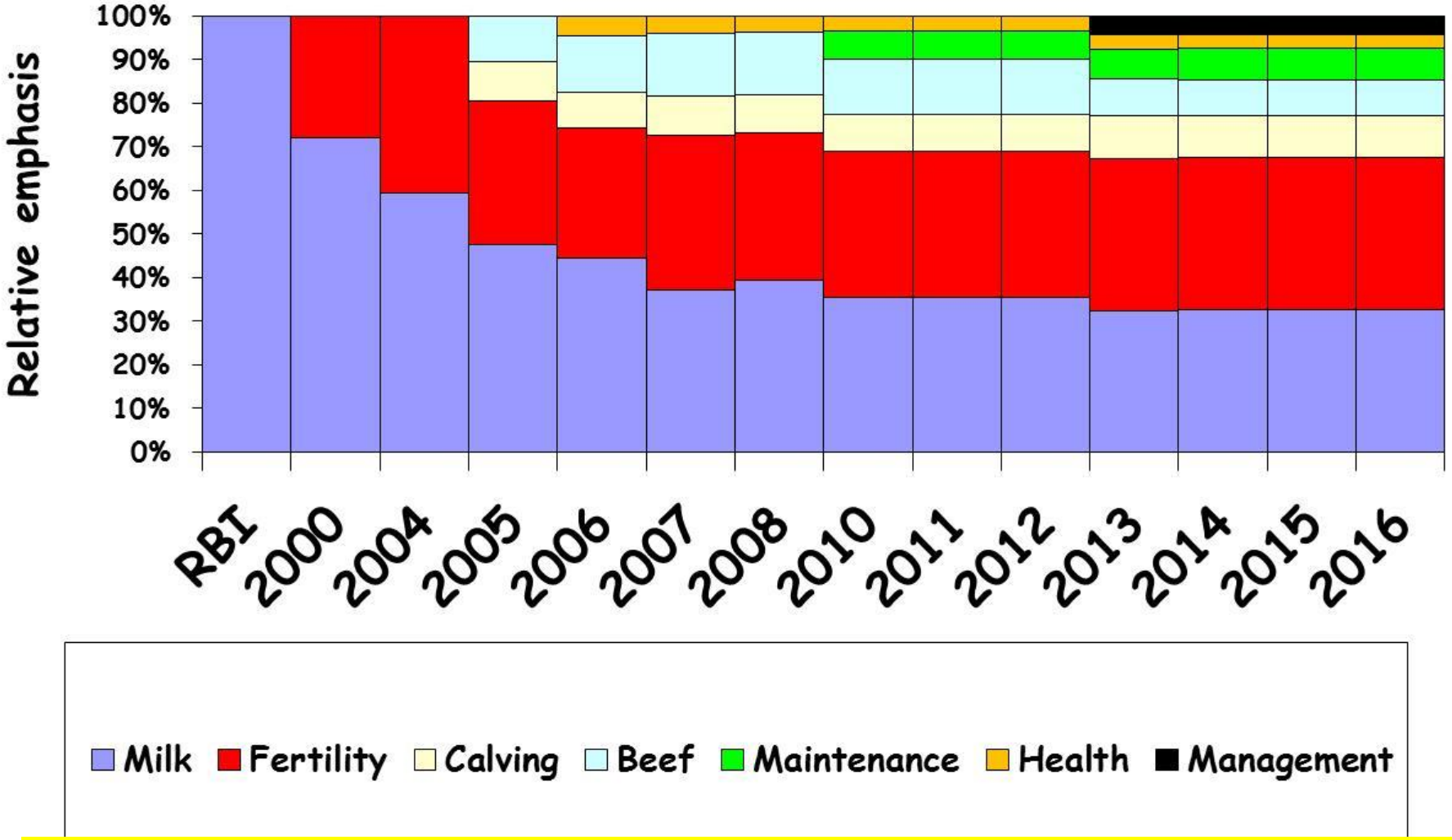
IRISH farmers desperately need an Index that includes measures of fertility.

The Moorepark research increases the urgency of the new index being drawn up by the ICBF and due to be released in late November.

For the first time the index will be produced that will include traits linked to fertility.

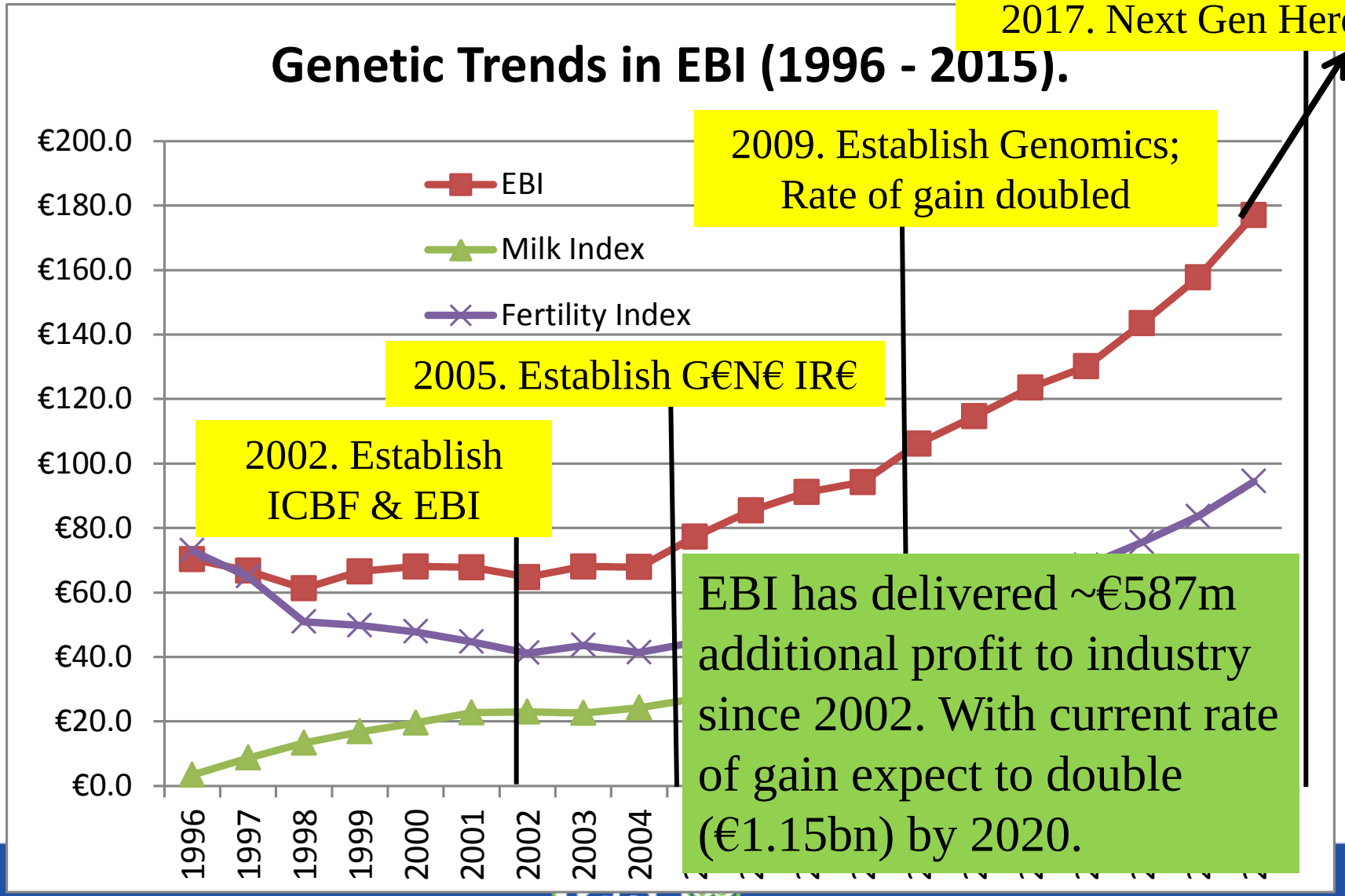
"Other countries are starting to record traits that are linked to fertility. With our compact calving system the need in Ireland is much greater," said ICBF geneticist Dr.

Evolution of the EBI (2000-2017)

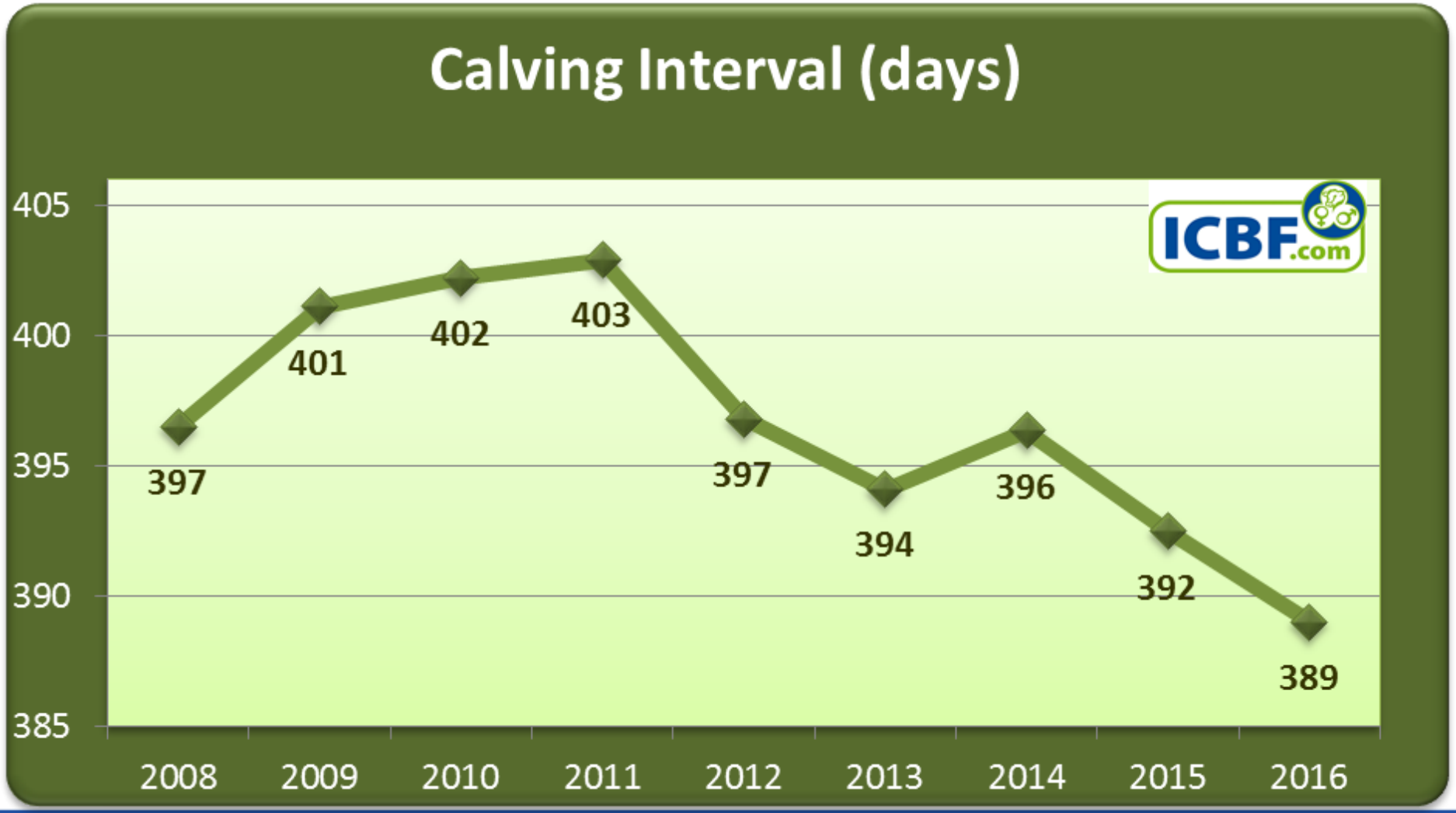


- The ideal Irish dairy cow; High milk solids (500 kg MS/cow/year) & excellent fertility (CI = 365 days).

Genetics Works; Example EBI



What has happened as a result of EBI

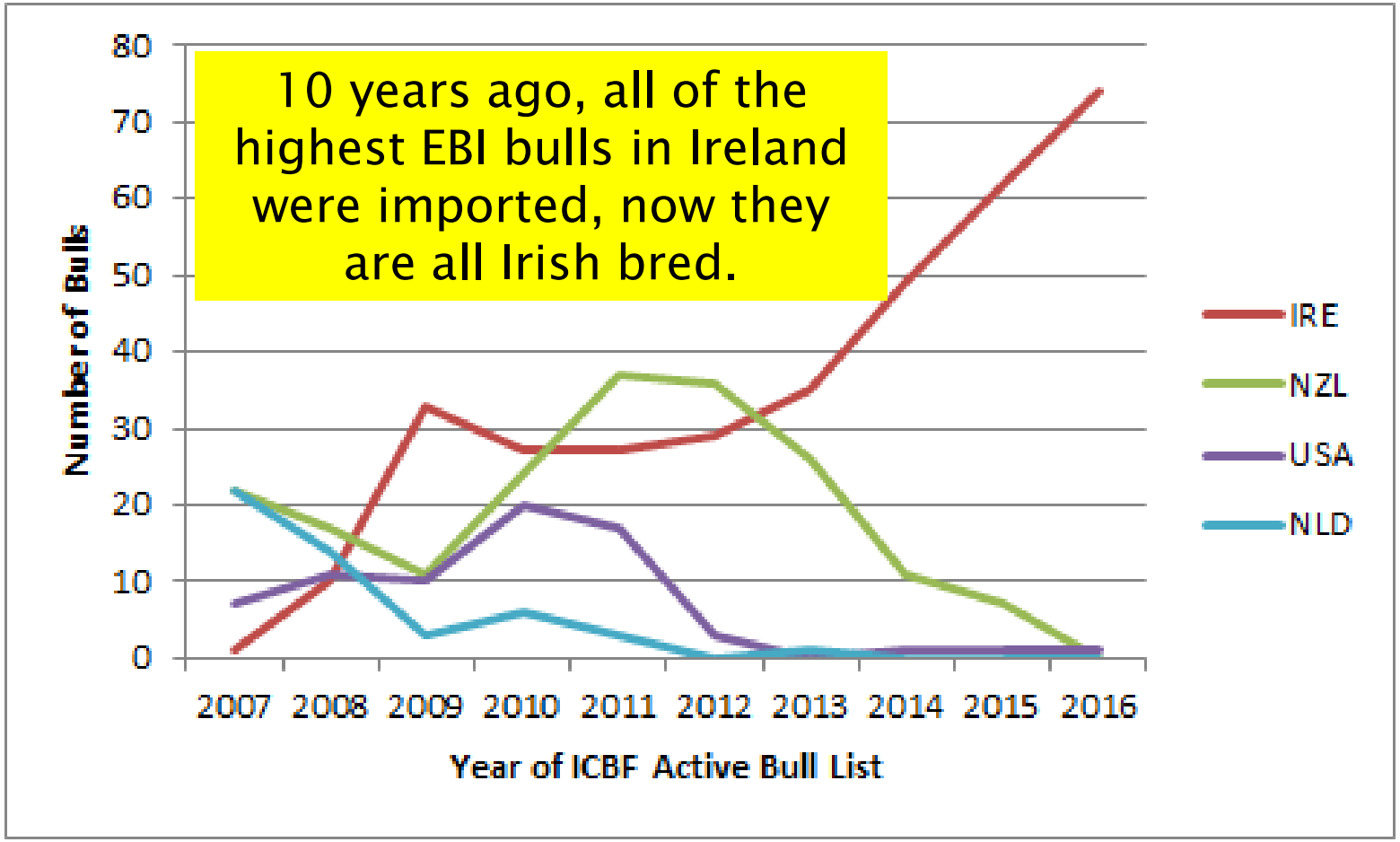


Next Gen Herd Fertility Performance 2013-2016

	Elite	NatAv	Sig
Submission rate (%)	92	86	<0.05
Pregnancy rate first service (%)	60	46	<0.001
Pregnancy rate first 6 weeks (%)	73	58	<0.001
Final pregnancy rate – 12 weeks (%)	92	81	<0.001
Calving to conception interval (days)	76	81	<0.05
No. of services	1.57	1.77	<0.01

Impact; ICBF Active Bull List

(Top 75 available AI bulls ranked on EBI).



Typical Irish beef farm; 25 cows, calving in Spring, producing 1 weaned calf/cow/year. Part-time farming.

Where we started; Irish beef herd 2017

http://www.agriland.ie/farming-news/no-profi

No profit to be made from ... ×

AgriLand
IRELAND'S LARGEST FARMING NEWS PORTAL

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Home » Beef » No profit to be made from production on the average suckler farm – Teagasc

No profit to be made from production on the average suckler farm – Teagasc

6:30 am - June 8, 2017

Gillian Dufficy
Email

94 Shares

Increases in support payments led to higher suckler farm income figures in 2016, which otherwise would not have been the case, according to Teagasc.

Despite a reduction in prices, the average suckler farm income increased marginally by 2%. However, the sector still reported

POPULAR POSTS

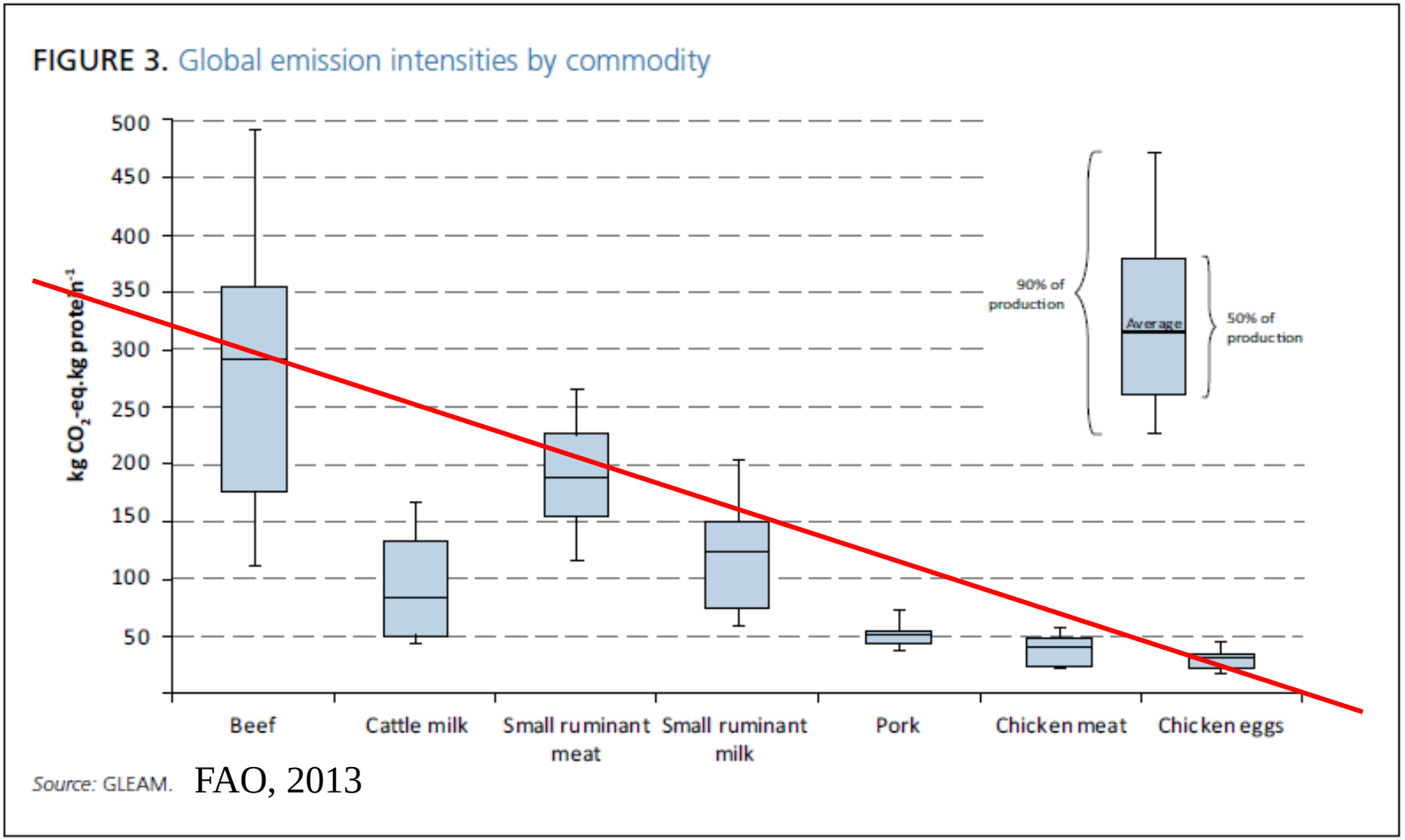
How to get to the National Ploughing Championships 2017
SEPTEMBER 17, 2017

Updated: Man dies in tragic farm accident in Wexford

EN 08:26 20/09/2017

ICBF.com

GHG; Beef Cows are a real problem!!

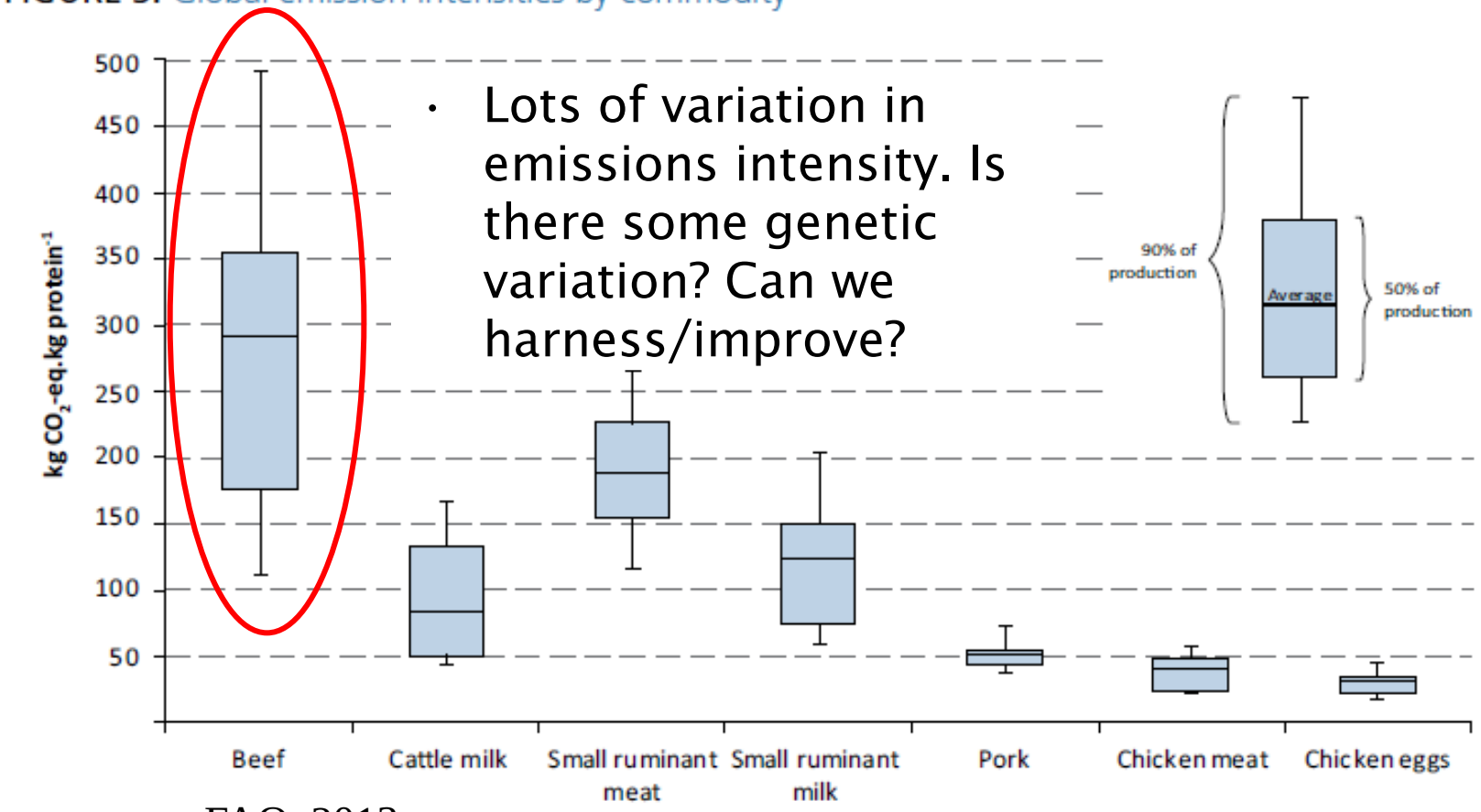


FAO, 2013

We all need beef cows.

- Suckler cows & beef cattle are a key part of rural infra-structure, especially in Ireland
  - Small fragmented farms, marginal land etc.

Innovation; Another Approach!



- Lots of variation in emissions intensity. Is there some genetic variation? Can we harness/improve?

FAO, 2013

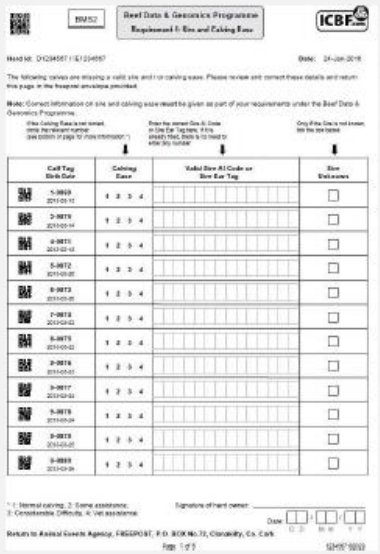
Food Wise; Smart & Green.

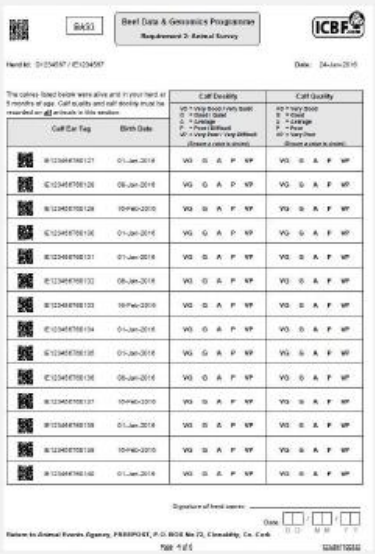
- Apply the latest DNA technology to support an important indigenous industry
- Simultaneously addressing global challenges around GHG and food security

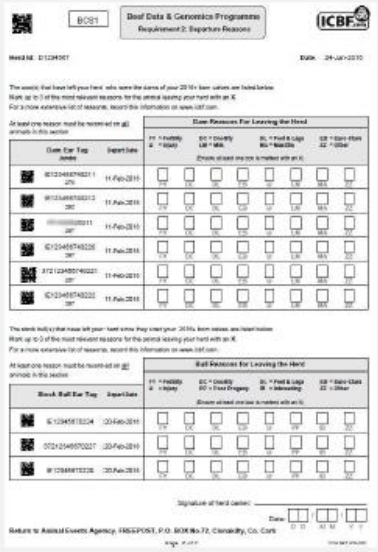
The Irish Beef Genomics Scheme.

- Focused on breeding more profitable, sustainable and carbon efficient cows.
- Funded from EU Rural Development Program.
- €300m total funding 6 years (2015-2020)
  - Farmers paid ~€90/cow/year to complete key actions re: the scheme.
  - ~1.2m animals genotyped to-date. ~2.5m animals in total will be genotyped during period of scheme. Cost of genomic service is €22/animal.
- Building Ireland toward DNA based calf registration (& increased genetic gain).

BDGP Data Recording; Farmer data







Information Collected

Calf
- Sire
- Calving Ease
- Birth Size
- Vigor

(at 5 months)
- Quality
- Docility
- Scour
- Pneumonia

Dam
- Docility
- Milk-ability
- Departure Reason

Stock Bull
- Docility
- Functionality
- Departure Reason

- ~600k records/trait/year (cow & calf).
- Excellent heritability estimates, e.g., docility @ 30% with rg of 0.85 with data from “expert” scorers.

€uro-Star Replacement Index.

Trait	Goal	Relative wt
Calving	Less	16%
Feed Intake	Less	18%
Carcass wt (for age)	More	21%
Maternal milk	More	18%
Female fertility	More	23%
Docility	More	4%

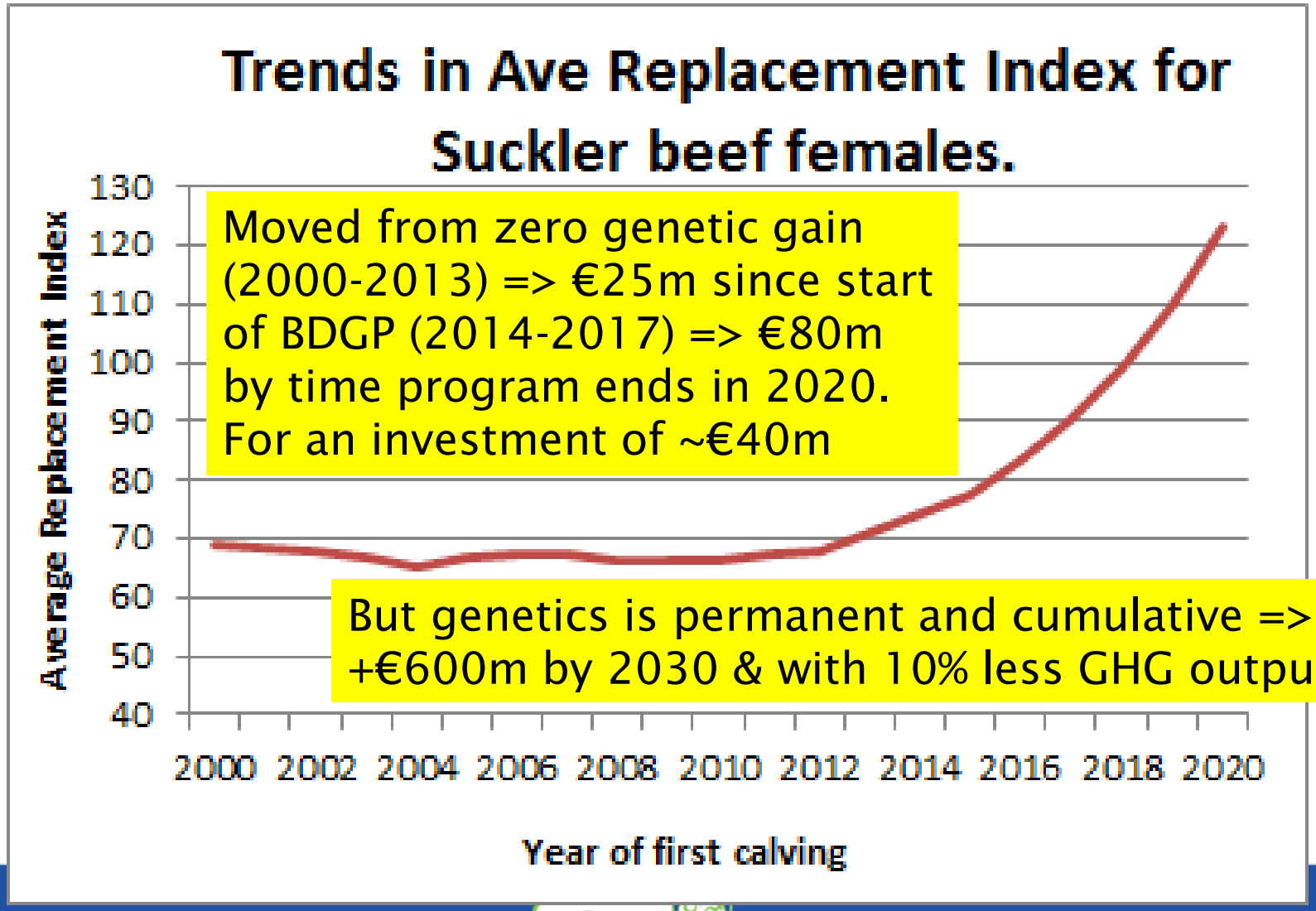
- The ideal Irish beef cow; A weaned calf every year of good weight & quality.

5 star cows are more profitable & more carbon efficient.

Stars	Repl Index	Cow Wt	Calf wean weight.	Calving Interval	Progeny carcass wt	Co2 Output
5 Stars	€108	669 kg	336 kg	403 days	358 kg	3,355 kg
4 stars	€86	680 kg	324 kg	407 days	356 kg	3,432 kg
3 Stars	€60	690 kg	319 kg	411 days	356 kg	3,475 kg
2 stars	€43	691 kg	315 kg	416 days	357 kg	3,502 kg
1 Star	€12	739 kg	309 kg	423 days	357 kg	3,552 kg

- Compared to 1 star cows, 5 stars are;
  - more profitable, sustainable & carbon efficient (+€100/cow). Cows that will produce more from less
- How do we generate more 4 & 5 star cows?

Genetic Trends in Beef Profit.



Computer requirements for ICBF genomic evaluations

I phone 5
1 GB RAM

Cerus x **2**
Ram 6,000 GB
Disk 40,000 GB

Igen2
Ram 760 GB
Disk 4,000 GB

198
Ram 356 GB
Disk 1,500 GB

151
Ram 120GB
Disk 1,800GB

143
Ram 64GB
Disk 698GB

109
Ram 16GB
Disk 279GB

163
Ram 2GB
Disk 80GB

2005	2007	2010	2013	2015

Ireland & Turkey – Opportunities.

- Export of semen from high genetic merit AI sires for use in Turkey.
  - 150k units/year.
- Export of live cattle.
  - 20k male weanlings for slaughter in Turkey.
  - 3.5k females for breeding.
    - 1200 of these are genotyped with 70% of these 4&5 star!

What should Turkey do next?

- Embed the technology => key focus of todays conference.
- Establish infra-structure to deliver the potential of genomics.
  - Database, genotypes, training population, genomic evaluations…..
  - Govt & industry must work together.
- Build your own indigenous livestock breeding program to support the growing needs of your country.
- Work with partners to help you achieve this.

Summary.

- Agriculture is undergoing a DNA technology revolution.
- Ireland is at the front edge of that revolution.
  - Strong partnership between ICBF, DAFM, Teagasc, cattle industry & farmers is allowing this happen.
- Genomics works. It will have a major role in addressing global challenges around environment and food security in the future.
- Great opportunity for Turkey to initiate large scale genomics based breeding programs in the future.
  - Disruptive yes, but allows you start very quickly.

Thank You.